

REMARKS

The following remarks and the above amendments are submitted to address all issues in this case, and to put this case in condition for allowance. The claims are amended solely to eliminate the “and/or” phrase and to better define the subject matter of the instant invention. The new claims are based on the disclosure of the instant specification and figures and do not add any new matter. After the above amendment, application claims 14, 16-17, 20-22, 24-25, and 27-32 are pending in the application. Application claim 14 is the only independent claim.

Applicant has studied the Office Action Mailed April 27, 2005 and has the following remarks.

35 U.S.C. §103

The Examiner has rejected the prior claims in light of the combination of Waters et al (4,344,505) in view of Brush Jr. et al (4,048,926). Dependent claims were further rejected in light of the above combination further in view of Fier (4,302,126), Sciambi et al (4,591,022), Anghinetti et al (3,896,595), Fuller (4,281,743), Porter (5,628,158), and/or Daw et al (4,832,153).

Waters and Brush Jr.

Applicant respectfully traverses the rejection of claim 14 on the grounds that the Examiner has not presented a *prima facie* case of obviousness and that the current claims are not obvious in light of the above combination.

As stated in MPEP §706.02(j) a *prima facie* case of obviousness requires three criteria:

There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a

reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The Examiner has essentially admitted that since Brush Jr. is directed toward a safe for containing valuables, it is not in the same field of endeavor as Applicant's attic access closure, but argues that Brush Jr. is reasonably pertinent to the particular problem to which Applicant is concerned. Applicant respectfully traverses as the inventions of Applicant and Brush Jr. are concerned with solving separate and quite distinct problems. The problem with which Applicant is concerned is the energy efficiency of a building, particularly with respect to attic openings. Brush Jr., on the other hand, is concerned specifically with the prevention of fire damage to valuables stored in a safe. One of ordinary skill in the art of energy efficient attic closures would not look to fire-proof safe closures for assistance in solving the energy efficient attic closure problem. Further, one would not look to a safe door as a modification to an attic insulating structure. When viewing the present application and Brush Jr. one sees that the fields of endeavor are disparate and the solutions provided are to distinct problems and are not reasonably pertinent one to the other. The Examiner's definition of the problem is much too broad, and Applicant asserts that the pertinent problem is insufficient attic access sealing, therefore the Brush Jr. reference is non-analogous art not pertinent to the particular problem.

Applicant also contends that there is no suggestion or motivation to combine the Waters and Brush Jr. references. These references are to unrelated structures and give no indication that use of the additional structure is in any way desirable. The Examiner has previously responded that motivation is provided because: "the combination of references provide secure sealing of the closure member to the opening per the framing. The enhancement thus allows Waters et al's structure to tightly seal the opening and improves insulation" and "[w]ith respect to applicant's arguments that Waters et al does not suggest the desirability of the proposed combination. . . the

modification of Waters et al by Brush Jr. et al allows the closure member to better insulate the interior space of the opening. Also the combination of the references satisfies the snug fit seal of claim 14.” [April 27, 2005 Office Action Pages 9-10]

Applicant respectfully traverses as these statements fail to recite any pertinent motivation to combine since in making these statements the Examiner is using the Applicant’s disclosure to provide the motivation. The Examiner’s statements merely assert that using a component of Brush Jr. provides an improvement to the device of Waters and therefore provides the elements of the claims. That the combination is an improvement as judged by the Examiner does not show motivation to combine from the reference, but is merely a statement that Applicant’s claimed device is an improvement over the disclosure of the Waters reference. The Examiner is respectfully reminded that “The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.” MPEP §2143.1 [emphasis in original]. “The teaching or suggestion to make the claimed combination. . . must. . . be found in the prior art, not in the applicant’s disclosure.” MPEP §2143. There is no suggestion in the prior art of the desirability of the combination used by the Examiner.

The Examiner seems to imply that the suggestion of combination (desirability) is that the resultant product seals better and is a better insulator (it “allows the closure member [of Waters] to better insulate”). This is, if suggested at all, only suggested by Applicant’s disclosure, not by Waters. The Waters reference abundantly asserts that his design is a sufficient insulator and provides a sufficient seal without making any mention of a depending central portion or second seal. Waters clearly does not indicate that modification of the Waters design by inclusion of a second seal from a depending central portion to provide more insulation would be desirable, as a

depending central portion, or the failure of Waters device to provide sufficient insulation, is nowhere discussed in Waters. The only document which indicates that the inclusion of a second seal from a depending central portion is desirable in an attic closure is Applicant's disclosure.

Not only has the Examiner not provided a motivation to combine the cited references, but also, he still has not shown a reasonable likelihood of success, nor all elements of the instant claims.

In the first instance, the device of Waters provides that the internal opening is generally rectangular and provides for four planar faces on the interior of the opening (see, for example, the Figures of Waters). Therefore, a depending central portion (even if indicated, and it is not) would have to provide a straight passageway in the jamb area in order to form a seal with the interior surface of the opening. Brush Jr. specifically requires that there be no straight passageway in the jamb region: "The inner shell 14 and the door shell 16 have a step or other irregularity 20 in the jamb region. . . so there is no straight passageway from the inside to the outside of the safe 10." (Col 3, lines 62-66). Therefore, there is no reasonable chance of success as the exterior shape of Brush Jr.'s door and the internal shape of Waters opening are clearly incompatible. They could not form a seal with each other. Further, the device of Waters is designed to be used on an access including a ladder and there is no indication that clearance is provided for a depending central portion to be added. Such inclusion would, in fact, probably hit the ladder. See e.g. FIG. 2.

Further, the door of Waters is designed to be hinged. As was previously pointed out by Applicant, the combination of Brush Jr. and Waters would result in a combination which would not work as the second seal (which requires a close proximity of the periphery of the depending central portion and the inner surface of the opening) would prevent the hinged opening of the lid.

This is made further explicit by the fact that claim 14 as amended, recites that the closure member is independent from the frame when the closure member is disengaged from the frame.

Based on the above arguments, Applicant asserts that the Examiner has not provided a *prima facie* case of obviousness. In the event that the Examiner continues to maintain his position, however, Applicant also asserts that the current claims, as amended, are non-obvious over the cited combination of Waters and Brush Jr.

The combination fails to show a device where the closure member is independent from the frame when the closure member is disengaged from the opening in the frame as indicated by claim 14, as amended. The device of Waters clearly shows a hinged lid, and also discusses what appears to be a permanently attached lid with the frame on rails. Not only is there no suggestion to use an independent closure member in Waters, but Brush Jr. does not make up for that lack of teaching. The Examiner has previously asserted that Brush Jr. “forms a matingly sealing surface with the periphery of the opening The teaching thus enhances the tight fit of the closure member of Waters.” (April 27, 2005 Office Action Page 9). The Examiner has thus clearly asserted that he is using the lid of Waters with an additional component (the lid of Brush Jr.) attached thereto. Further, the Examiner stated this to argue that the vent hole of Brush Jr. is not indicative of a teaching away of a door which seals clearly implying that Brush does not show the lid, only the seal. In the same way, and by the same logic, the Examiner cannot now argue that Brush Jr. provides the independent closure member.

Still further, Applicant also provides herewith a Rule 132 declaration as an indication of non-obviousness. In particular, the Applicant points out that numerous customers, resellers, contractors, and a University have recognized that The Energy Guardian™, a device which is believed to embody at least claim 14 of the instant case, is an innovative solution to a long felt

problem. The Declaration and attached documents point out how prior attic covers were insufficient and did not effectively solve the problem of how to provide energy efficient attic closures. Some attached documents specifically refers to the instant device as an improvement over prior designs due to the inclusion of the sealing lid extension (the second seal created by the depending central portion) as it eliminates the problem present in other devices of properly positioning the lid and sealing. This recognition by the industry of a device embodying the present claims as an innovative solution to a long-felt problem provides for additional evidence that claim 14 is non-obvious. The Rule 132 declaration also shows that another company has copied the design of The Energy Guardian™ a further indication of non-obviousness. These secondary considerations of non-obviousness provide further support to the conclusion that the device of the instant claims is non-obvious.

In light of the above remarks, Applicant respectfully requests that the Examiner withdraw the rejection of claim 14 in view of Waters and Brush Jr. As all other claims depend from claim 14, Applicant further requests that the rejection of the remaining claims over Waters and Brush Jr. also be withdrawn.

Fier, Sciambi, Anghinetti, Fuller, Porter, and Daw

Applicant notes that all remaining claims are dependent on claim 14 and claim 14 only stands rejected in light of the combination of Brush Jr. and Waters. However, simply for completeness, Applicant points out that the Rule 132 declaration is equally relevant with regards to each of the claims that depend from claim 14 and any combination of cited references.

Further, Applicant again asserts that none of these secondary references in combination with any of the primary references provides the necessary elements of an insulated cover for an overhead attic opening including a first inner seal and a second seal overlying a frame

surrounding the access opening as discussed in claim 14. As all other claims depend from claim 14, if claim 14 is allowable in light of the references, all remaining claims are also allowable.

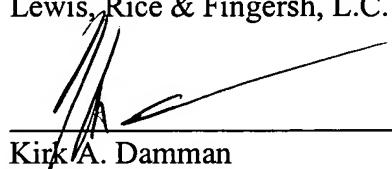
Conclusion

In light of the above remarks, Applicant believes there are no further issues regarding the patentability of the pending claims and respectfully requests the Examiner withdraw his rejections and allow all pending claims so that this case can pass on to issue.

Applicant believes no additional fees are due in conjunction with this filing, however, the Commissioner is authorized to credit any overpayment or charge any deficiencies necessary for entering this amendment, including any claims fees and/or extension fees to/from our **Deposit Account No. 50-0975**.

If any questions remain, Applicant respectfully requests a telephone call to the below-signed attorney at (314) 444-7783.

Respectfully submitted,
Lewis, Rice & Fingersh, L.C.



Kirk A. Damman
Registration No. 42,461
Attorney for Applicant

Dated: July 27, 2005

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:
James B. Melesky

Appln. No. 10/024,478 : Art Unit: 3637
Filed: 21 December 2001 : Examiner: A. Phi Dieu Tran
For: INSULATION COVER FOR ATTIC CLOSURES : Docket No.: 82/1376US
: Formerly: 13811

Commissioner for Patents
Alexandria, VA 22313

Rule 132 Declaration
(Secondary Considerations of Non-obviousness)

Being of legal age, I, James B. Melesky, declare and state as follows:

- 1) This declaration is to establish secondary considerations of non-obviousness in the above referenced application.
- 2) I am the inventor of the above referenced application and familiar with its disclosure and claims. I am also the President of ESS Energy Products, Inc (f/k/a Energy Sentry Solutions, Inc.) which manufactures and sells a device under the Trademark "The Energy Guardian." I am familiar with the design of The Energy Guardian™.
- 3) I have reviewed claim 14 of the above referenced application and believe that The Energy Guardian™ embodies the elements of that claim.
- 4) I have attached hereto a number of exhibits demonstrating the perspective of persons knowledgeable in the art, who believe the invention to be an innovative step beyond the prior art solving a long-felt need in industry. This evidenced perspective is indicative of the non-obviousness of my invention.
- 5) I have attached hereto as Exhibit A a copy of an article which appeared in the October 27, 2003 edition of the Daily Local Newspaper.
 - a) The reporter states in that article that The Energy Guardian™ is "innovative," "invented," and that there was a need for such a product.

b) The article states that The Energy Guardian™ won the Environmental Excellence award from the Kutztown University Small Business Development Center. An award which it did win.

6) I have attached hereto as Exhibit B a printout from REWilliams Contractor Inc's website. REWilliams sells a large number of different products on their website with a focus on money saving products. REWilliams lists The Energy Guardian™ as one of only 14 "Innovative Items" they sell

7) I have attached hereto as Exhibit C a letter I received From Rocco Pace who is the President of Oliver Heating and Cooling and the Vice President of the Delaware Chapter of the Air Conditioning Contractors of America. The letter states:

- a) The Energy Guardian™ is an "innovative solution" to saving energy.
- b) That Mr. Pace has not seen a comparable product in 27 years in the HVAC industry.

8) I have attached hereto as Exhibit D a letter I received from Art McKeown who is the Owner and President of AEM Custom Builders, Inc. and hosts "Art the Builder" a syndicated radio show related to home improvement.

- a) Mr. McKeown states that he has been a builder for almost 30 years.
- b) Mr. McKeown has hosted a weekly talk radio show related to home building and improvement for the last 7 years.
- c) Mr. McKeown states that The Energy Guardian™ is the most practical and effective solution to attic sealing he knows of.
- d) Mr. McKeown states that the extension from the lid is of particular benefit as it insures the lid is correctly attached and sealed.

9) I have attached hereto as Exhibit E a letter I received from Vic Alshire President of the Comfort Company. The letter states:

- a) Mr. Alshire has 30 years of experience in residential energy conservation.
- b) Mr. Alshire has worked with scientists at Oak Ridge National Laboratory regarding energy conservation measures.
- b) Mr. Alshire uses The Energy Guardian™ as part of national training for the Weatherization Assistance Program

- c) Mr. Alshire has reviewed a large number of energy saving products and procedures.
- d) Mr. Alshire states that it is his opinion that there has never been a product to properly seal the attic prior to The Energy Guardian™
- e) The design of The Energy Guardian™ having a lid which fits into a frame is critical for insulating and sealing attic accesses.

10) I have attached hereto as Exhibit F an article I prepared for Home Energy Magazine, March/April 2005 Edition. The article accurately references various statements related to The Energy Guardian™. Those statements are:

- a) A statement by Vic Alshire (mentioned in paragraph 9) that "The upgrade must have a two-piece design [as The Energy Guardian™ does] that creates a barrier while also providing access to the attic. Therefore, a single piece unit is fatally flawed for use in most homes."
- b) A statement by Kevin Soucy, president of Affordable Energy Solutions LLC that "The flimsy solutions used in the industry for years just don't cut it."

11) I have attached hereto as Exhibit G a copy of the July 2003 Issue of Energy Design Update which shows The Energy Guardian™, and three other designs of attic cover. The Energy Guardian™ has listed improvements over a design called the "Draft Cap."

12) I have attached hereto as Exhibit H a blower door test result which is representative of repeated test results performed by a number of different organizations showing a dramatic improvement in attic sealing due to the inclusion of The Energy Guardian™.

13) I have attached hereto as Exhibit I printouts of various pages from the website of Progressive Energy Solutions, Inc (PES) showing their "Energy Shield I" product. PES is not affiliated with ESS Energy Products, Inc. I have examined the pictures of the Energy Shield and believe it to be a copy of The Energy Guardian™, indicating adoption of the invention by the trade.

14) I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

7/22/05
Date

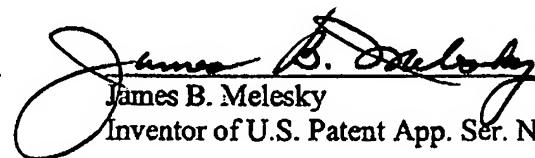
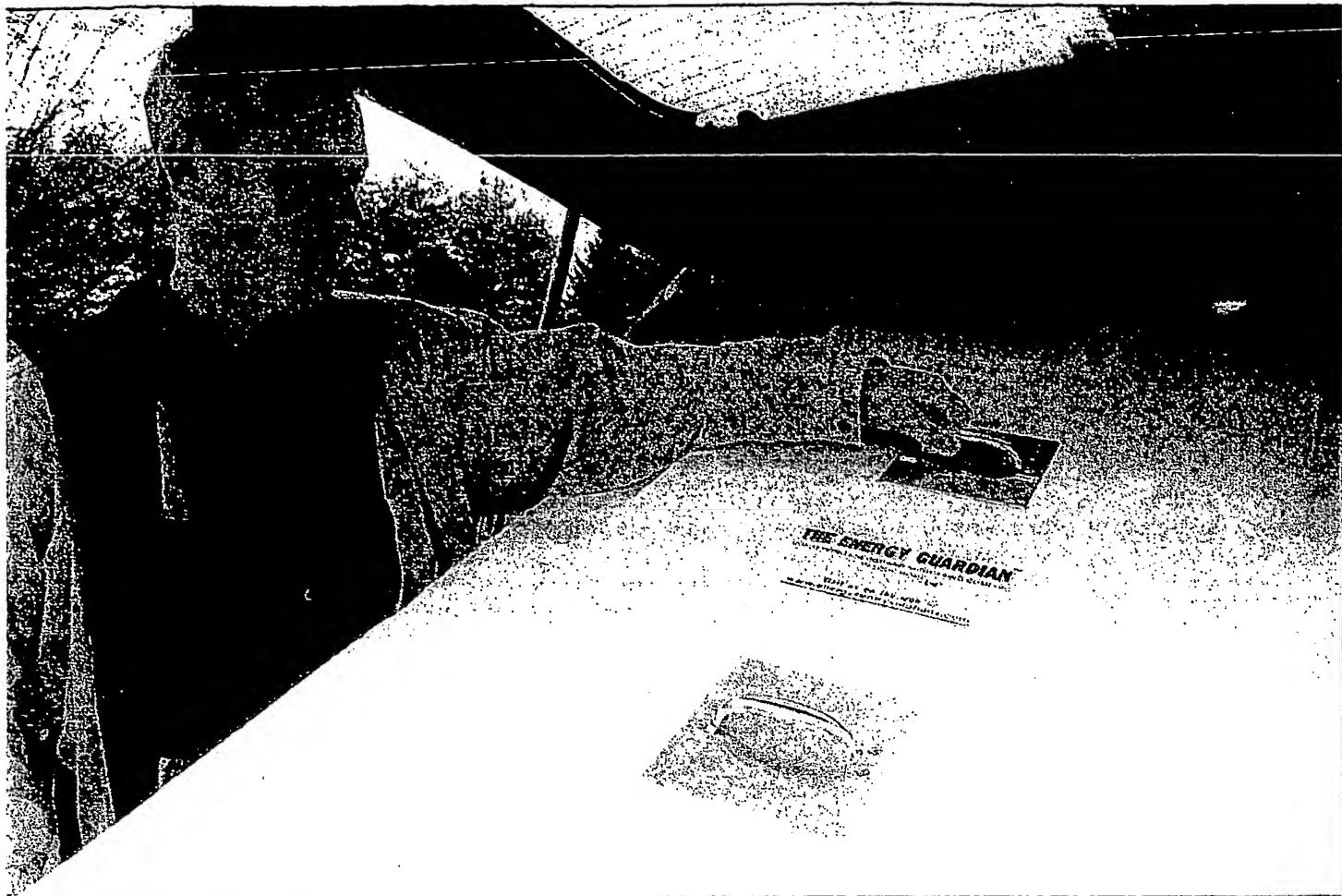

James B. Melesky
Inventor of U.S. Patent App. Ser. No. 10/024,478

Exhibit A



Staff photo by Larry McDevitt

im Melesky shows off a model of the Energy Guardian, which he invented to insulate and seal attic accessories in homes after his son complained of his room being too cold. Melesky found no such device available for sale and so decided to manufacture one himself.

If you want something done ...

Do-it-yourself father invents energy saver

BY GRETCHEN METZ

Staff Writer

PAOLI — James B. Melesky became an inventor all because his teenage son complained his bedroom was cold in the winter.

Listening to the complaints, Melesky went into his son's closet, climbed up a ladder and poked his head up through the attic hatch cover.

"I looked at it and said, 'There's a hole in my insulation,'" recalls Melesky. Cold air was leaking into his son's room through the spaces around the attic door.

Being a "do-it-yourselfer," Melesky decided to tackle the problem. But when he went looking for a solution, he

found only frustration.

Searching the aisles at the local "big box" home improvement stores for a device to insulate the hatch, he found kits to install hatch covers and kits to install pull-down attic stairs, but nothing to insulate and seal the air leaks around the plywood where the insulation had been cut away by the contractor.

Retail clerks agreed there should be something, but there wasn't.

"You find a solution, you'll sell millions," Melesky said he was told.

So the Tredyffrin resident reviewed the situation and

built a prototype out of plywood and insulation material. The problem, it was 60 pounds. Even his wife told him to rethink the weight.

That was 2001. Two years later, Melesky is now the president of his own company, Energy Sentry Solutions, headquartered in Paoli, with a new, less weighty product on the market — the Energy Guardian.

Energy Guardian, a light, high-density expanded polystyrene, fits around the attic access with a tight-fitting insulating door that seals out leakage. Materials for the product

are produced in Allentown. It is assembled near Harrisburg.

As with many innovators/entrepreneurs, Melesky was a customer for one of his first models. He said his electric and air-conditioning usage dropped 10 percent in April, 15 percent in May and 20 percent in June from those months a year earlier when he installed the product.

Then Melesky started selling the device to neighbors.

"We think it's great," said Scott Hall, a neighbor in Tredyffrin. "I'm just mad I didn't think of it."

Hall said if someone in the family forgets to close up the Energy Guardian, the difference is felt on the second floor right away.

But it was Hall's utility bills that convinced him the device

♦ See ENERGY, Page B8

“You find a solution, you'll sell millions,” Melesky said he was told.

(From Page B1)

really worked. He said his air-conditioning bills are down 30 to 35 percent in the summer and gas heating bills are down 25 to 30 percent in the winter.

Melesky explains it this way: Homeowners are conscientious about pulling down the flue in the fireplace after the fire goes out to keep cold air from rushing in, and that's only one foot wide.

Meanwhile, the pull-down ladder in a new suburban home might be 12 square feet of noninsulated plywood, with an R-Value of .25 to .5. (R-Value is the measurement of the effectiveness of insulation. The

Melesky's Energy Guardian has an R-Value of R-28 to R-42.

Melesky's product received the Environmental Excellence award from the Kutztown University Small Business Development Center. The award recognizes companies that work with the center's Environmental Management Program.

"They found us," Melesky said. "We didn't go to them."

Rather than heading straight to retail, Melesky marketed his product to the federal government. The product is now used in several federal programs to help low-income families save money on heating bills.

Melesky said he likes that the product is being put to good use. Even better, it is the government that is testing the product. In a recent govern-

ment test, the Energy Guardian, alone reduced the air leakage in a test house by 29 percent, Melesky said.

"Talk about a high-impact solution," Melesky said.

The cost of the attic access hatch insulation kit is \$85 and the pull-down stairs insulation kit is \$140. Melesky is offering the price in November and December with no shipping and handling charges.

"A year ago the price was more than \$300," Melesky said, noting that selling in volume makes the difference.

The kit requires no measuring, no tools, no cutting — just take the product into the attic and stick it together.

Information about the product is available on its Web site — www.energyentrysolutions.com

— along with a phone number to call to order the product.

Melesky said he is currently working with a retail chain to get the product on store shelves. He has applied for a U.S. patent.

Melesky, 54, a retiree from the information technology field, used personal financing for the company's start-up. "It allowed me a pace that was far more prudent," Melesky said.

The flexible pace meant Melesky could take time needed to aggressively work to get feedback and improve the product.

"This is not a quick hit-and-run endeavor," he said. "If they are going to spend the money, I want them to have a good solution."

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Exhibit B

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[Home](#) > Innovative Items

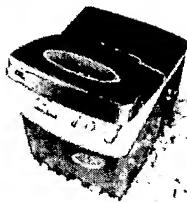
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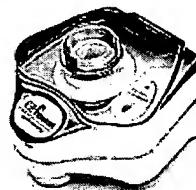
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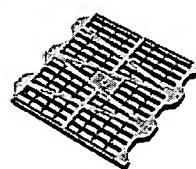
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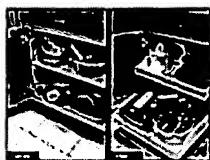


dryer vent, which means higher heating bills in winter and higher cooling bills in summer. It can be painted and easily mounted over a 4" vent pipe.

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Exhibit C



Heating & Cooling

May 4, 2005

Mr. James B. Melesky
President
ESS Energy Products, Inc.
P.O. Box 400
Paoli, PA 19301

Dear Jim:

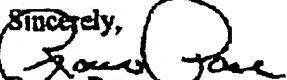
As we conclude our first year of doing business with your firm, I want to give you some feedback on our experience.

As both the President of this firm as well as the Vice President of the Delaware Valley Chapter of the Air Conditioning Contractors of America, I am always on the lookout for innovative solutions that can save energy or improve the comfort for homeowners.

The Energy Guardian™ Attic Access Covers are a home run as they do both. The product design is truly unique and innovative. They save energy in both the summer and winter months and make homes more comfortable. I am very pleased that we can provide this solution to our clients. I have been in the heating and air conditioning business for 27 years and there is nothing in the market to compare with your products. They work just as represented and are very cost effective for homeowners.

Your turnkey sales program makes it very easy for any HVAC firm to quickly start up with ESS. We are very pleased with the program and more importantly with our clients' satisfaction with *The Energy Guardian Access Covers*.

I highly recommend your program and products to any HVAC firm.

Sincerely,

James B. Melesky
President

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Exhibit D

AEM Custom Builders Inc.

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www.artthebuilder.com • [art @artthebuilder.com](mailto:art@artthebuilder.com)

May 20, 2005

Mr. James B. Melesky
President
ESS Energy Products, Inc.
P.O. Box 400
Paoli, PA 19301

Dear Jim:

As a builder for nearly 30 years, and past President for the Chester/Delaware County Home Builders Association, I am confident that I have come across almost every problem imaginable in a home and all types of solutions to those problems.

In all these years, I have never seen a more practical or effective solution than *The Energy Guardian™ Attic Access Covers*. These products solve a big problem that exists in virtually all homes today. I can speak from experience as I have one installed in my own home.

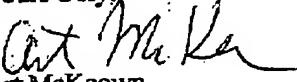
Having a product in an area of the home where there is likely traffic is always a tricky matter. First, it has to serve its intended use while being durable. Second, it must be very easy for the homeowner to use it properly and keep it effective. In the case of attic accesses, it is obviously very important to establish both a thermal insulating barrier as well as a tight air seal to stop the energy loss in both hot and cold weather. It must also be sturdy enough to withstand ongoing use. *The Energy Guardian™ Attic Access Covers* certainly fit the bill in those essential areas.

However, in order to be effective long term, the thermal barrier and air seal must be re-established easily after a homeowner returns from the attic. If it isn't easy to do correctly, the homeowner is very likely to get it wrong. As a result, it is almost assured that such a solution will not be effective over time.

This is where your product design is even more innovative and practical. When I close the lid into the frame, I can hear and feel the air seal established as the extension of the lid fits into the frame. It is unmistakable. Without that extension or lip, the lid could easily be returned to the wrong position and the air seal would be compromised. With your product, it is almost a certainty that it is always returned properly in place. You have made the solution virtually "homeowner proof".

You have achieved exceedingly high practicality and effectiveness which is a rare combination- congratulations and best wishes.

Yours truly,


Art McKeown
President

BEST AVAILABLE COPY

Exhibit E

Comfort Company LLC
4795 St Rt 41 NW
Washington CH, Oh 43160
(740) 335-3852

June 24, 2005

Mr James B. Melesky
President
ESS Energy Products, Inc
Po Box 400
Paoli, Pa 19301

Dear Jim:

I want to share my impressions with you regarding *The Energy Guardian Attic Access Covers*. As you know, I have personally installed a number of your units and even use it as part of training that I provide on a national level for the Weatherization Assistance Program.

Over the past 25 years, I have worked in several important areas regarding residential energy conservation. My experience primarily includes home building and training weatherization experts on energy saving measures. I have frequently been a featured speaker at both regional and national conferences on the subject of energy conservation products, procedures, and methodologies. I have also worked with scientists at Oak Ridge National Laboratory regarding energy conservation measures. As a result, I have reviewed or used virtually every energy saving product and procedure available.

A particular concern of mine has been energy loss through attics in general and attic accesses in particular. More energy is lost through attics than anywhere else in a home. The attic accesses cause a great deal of energy loss in both hot and cold weather conditions. It is my professional opinion that there has never been a product to properly insulate and seal these attic accesses until *The Energy Guardian Attic Access Covers* became available to the industry. They meet all the critical criteria for insulating and sealing these accesses:

- A two piece unit to provide a protective barrier
- High R-Value
- Tight air seal
- A lid that fits into a frame to easily re-establish an air seal when used
- A design that can endure extensive use over a long period of time
- A lightweight unit that is easy for all ages to use

When one accurately projects the energy savings of this product, it has an unusually rapid payback period. Your product should be used as a national standard.

Very Truly,

Vic Aleshire
President

Exhibit F

ATTIC ACCESSES: HIGH PRIORITY OR NO BIG DEAL?

Some calculations answer the question. How much does proper attic access insulation matter?

BY JIM MELESKY

My firm, Energy Sentry Solutions, provides a product—the Energy Guardian—to insulate and seal attic accesses. In the course of everyday business, I have come upon a recurring difference of opinion among weatherization professionals regarding the importance of attic upgrades. Indeed, all weatherization programs address attic accesses with a wide variety of remediation measures. How much energy and money will the crew save the home's occupants by insulating and sealing the attic access? The answer can have a huge impact on projected savings, on the amount budgeted for this improvement, and on the type of measures used to upgrade this 5–10 ft² area of the home.

How Much Do Attic Accesses Matter?

To evaluate the consequences of different remediation measures, let's first examine the impact of attic pull-down ladders and pop-up hatches on the entire attic thermal barrier. While the measurements of the opening vary slightly, a typical attic ladder creates a 10 ft² opening. The ladder is attached to 1/4-inch plywood that has an R-value of 0.31.

There are some who insist that the lack of insulation over an attic access is of little consequence; they calculate the impact of not insulating the access by using an average R-value formula. In this case, we will examine a home with a



Alexis Garcia pokes her head through an attic access.

APG/MCBE

1,000 ft² attic that has R-38 insulation in the attic floor. The attic access is a pull-down ladder. To calculate the average R-value of the attic they use this formula:

$$[(38 \times 990 \text{ ft}^2) + (0.31 \times 10 \text{ ft}^2)]/1,000 \text{ ft}^2 = R-37.6$$

If this is correct, the pull-down ladder reduces the thermal barrier for the entire attic from R-38 to R-37.6. It would follow that the upgrade does not warrant much emphasis. In fact, this analysis is incorrect, but unfortunately people continue to believe in it to this day.

The DOE Weatherization Assistance program's *Residential Energy Workbook* explains in plain language how energy is

wasted in existing homes and offers a host of ways to upgrade homes for cost savings and improved comfort. The workbook addresses this specific matter of attic hatches with the following formula:

A/R for the pull-down + A/R for the rest of the attic = A/R total, where A = area and R = R-value.

$$990 \text{ ft}^2/38 + 10 \text{ ft}^2/0.31 = 58.31$$

U = UA/A, where U = U-value

$$58.31/1,000 \text{ ft}^2 = 0.05831$$

$$\text{Effective R-value} = 1/U = 17.1$$

This formula shows that the impact of not insulating an attic access is dramatic. The pull-down ladder reduces the R-value for the entire attic by 55%.

That means that the effective R-value for the attic is only R-17, although some people would say that it is R-38. Even a pop-up hatch has a big effect on the entire attic R-value. If we apply the same formula to a 22 1/2 inch x 26 inch hatch opening in the same attic, the effective insulating value is reduced to R-24 for the entire attic.

What about air leaks? Even if rolled or blown-in insulation covers a hatch, air can flow through this insulation. As a consequence, energy will still be lost through the attic access due to the air leak.

In addition, pull-down ladders have air leaks on all four sides of the plywood housing the ladder and almost always in the four corners of the wood framing. The two short sides of the ladder unit contain the widest gaps. There is approximately a 1/2-inch gap along the side where the ladder is hinged to the plywood. Opposite the hinged side is another 1/2-inch gap that gets larger every year—with the passage of time, the plywood will warp from the ladder being pulled down. It is not uncommon for this gap to grow to 1 inch. The framing for the ladder is usually made of 1 inch x 4 inch boards. Each corner will have a 1/4-1/8-inch gap that is 4 inches long. Gaps of various sizes also exist between the flooring and the framing for the pull-down ladder. At the low end, these gaps around pull down ladders add up to 40 square inches or more of leakage area. While the pop-up hatches come in various sizes and shapes, they pose the same basic problem, for they have significant gaps as well.

Anyone who doubts the effect of these air leaks need only stand near the access on a windy day or take a blower door test and follow the wind tunnel. If the house is reasonably sealed, the wind tunnel will lead directly to the attic pull-down ladder or hatch.

Is this just a winter problem? During the winter, hot air in the home rises and escapes through the attic access. Hot air is less dense than cold air and will naturally rise. This, along with the normal air flow in the home, creates the stack effect. It is similar to the way hot air moves upward in a chimney.

In the summer, the opposite occurs as hot air from the attic moves into the living area. It does this for several reasons. In principle, hot air will be drawn from the attic into the home by a fan or air conditioning unit in the home and by any breeze flowing through the attic via the vents. The air flow in the home will move any radiant heat built up on the hatch or pull-down cover into the living area. It will also move any convective heat that flows through the very low thermal barrier. Finally, as air

to the attic; air sealing the attic, including the attic hatch and the chimney; and installing a blanket on the water heater. The blower door test shows positive results, with a pretest reading of 4,931 CFM₅₀ and a posttest reading of 3,501 CFM₅₀. The weatherization crew followed agency procedure concerning the priority of upgrades. While a number of valid measures were accomplished, the crew focused on sealing and insulating the attic.

Applying the savings-to-investment ratio (SIR) that weatherization professionals understand, a cost-effective upgrade produces a result of 1 or greater.

In calculating the SIR, we use the effective thermal results and air leakage given above. We will assume that the home has oil heat. We will use conservative costs for fuel: \$1.20 per gallon for oil and \$0.10/kWh for electricity. If \$250 is spent to upgrade the pull-down ladder, the SIR for this measure is 6.28. If this same home has a pop-up hatch and \$150 is spent to insulate and seal that hatch, the SIR is 3.71.

When we calculate the SIR, we see that sealing and insulating attic accesses is very cost-effective. However, the type of upgrade implemented by weatherization agencies can vary widely.

Some agencies use measures that ensure a long-term, durable solution. One such measure is to install a hinged plywood container in a reverse U shape, filled with high R-value insulation. Another is to place a box-shaped plywood structure with high R-value insulation over the opening in the attic. Both measures have heavy-duty sealing and are secured by a hook and eye or strapping. These measures are very durable, but they require more time to make and a higher degree of expertise than simpler, but less effective measures.

Others agencies are not concerned about the longevity of the solution. If the upgrade passes an inspection shortly after it is completed, they think it is good enough. A typical example of this short-term approach for attic ladders is to use insulation board to create a box over the opening. The box is sealed with weatherstripping.



Once a chimney is sealed, it is safe to assume that it will not be disturbed. That is not the case with attic ladders and hatches. Is there an unsealed attic access under this insulation? If so, air leaks could be a big problem.

moves in the attic, the hot air will flow through air leaks in the attic access much as it does through the attic vents.

One must also take into account the cost of heating a home versus the cost of cooling it to determine summer cost versus winter cost. While precise comparison requires far more detailed information than this article allows, it is clear that considerable energy is lost in the summer. In a practical sense, then, the homeowner pays to heat the attic during the winter and cool it during summer.

Quantifying the Impact

To determine how much air leaks and degrading thermal barriers affect a home, let's consider the case of a two-story house with nearly 2,500 ft² of floor area that is located in Chicago. A weatherization crew has successfully accomplished a number of upgrades within budget, such as adding insulation

For hatches, insulation can be glued to the top of the hatch cover and weatherstripping applied to the perimeter of the hatch cover. While these measures cannot withstand wear and tear, they will produce blower door test results similar to the results achieved by more substantial and long-lasting upgrades. These less stringent alternatives cost less, but they only appear to have a sufficient SIR.

Does durability affect energy saving? The answer would seem to be yes. However, neither budgets nor procedures for weatherization programs allow for postinspections throughout the period of time that energy must be saved in order to justify an upgrade. Such inspections would reveal whether or not the upgrade remains intact and effective.

Nonetheless, since durability is a key component in forecasting energy savings relating to each upgrade, we must take a sober look at the realistic life of each upgrade if we want to make accurate projections.

The SIR calculation used by many weatherization agencies specifies an assumed period of time that a particular upgrade will remain effective. For an attic access, the upgrade is usually assumed to last at least 13 years.

Durability standards for various attic upgrades are necessarily more stringent in some cases than in others. Take the sealing around a chimney and around an attic access as examples. Both are very important, and both must last for the same period of time. However, once a chimney is sealed, it is safe to assume that it will not be disturbed. That is not the case with attic ladders and hatches. By building code, they provide a required means to gain access to the attic. That means that the upgrade will be subject to repeated use



RONALD REED

Weatherization programs address attic accesses with a wide variety of remediation measures. How much energy and money will the crew save the home's occupants by insulating and sealing the attic access? The answer can have a huge impact on projected savings.

and to impact with other objects—such as flooring, floor joists, or rafters—as well as with anything stored in the attic, each time the access is opened. This will wear both the air seal and the insulation. If the ladder and hatch upgrades are not made to withstand wear and tear, the SIR will be significantly reduced.

Returning to our Chicago home again, let us analyze the low-cost and less durable measures used to insulate and seal the attic accesses. For these upgrades, many agencies allocate \$150 for the pull-down ladder and \$80 for the hatch. Again, these upgrades may provide appropriate insulation and sealing of both attic accesses, but they are not usually durable. If through normal wear and tear the upgrades last only one year, the SIR falls to 0.80 and 0.53 respectively for the pull-down ladder and the hatch.

When they fall below the 1 thresh-

old, these upgrades are no longer cost effective. This is true even though they cost less to install, and although they could pass an initial weatherization inspection.

It is clear that durability matters.

Can the durability of the upgrade for attic accesses affect other valid upgrades? Returning to our example home, let us change the circumstances slightly. In this case, the home has a pull-down ladder and only R-19 insulation in the attic. An additional R-19 is blown into the attic at a cost of \$850 (\$0.85/ft²). The pull-down ladder is also insulated and sealed, using the less durable \$150 solution. Both upgrades seem to be cost-effective, as they produce an SIR in excess of 1. When the pull-down upgrade fails after one year, as we already know, it becomes an ineffective measure. However, it also has a devastating impact on the insulation that was blown into the attic. The R-38 insulation is reduced to an effective value of R-17. The added R-

19 insulation is reduced to an effective value of R-8.5. From a value point of view, that more than doubles the cost of the effective R-value/ft².

In short, \$1,000 was invested in a home that will not perform as intended. This example shows that the two upgrades cannot be viewed as separate and distinct measures.

What Should the Standards Be?

It comes as no surprise that there is a move to tighten up and improve the standards. The people behind this move have strong opinions. John Ohm, president of Ohm Weatherization in Bethlehem, Pennsylvania, stresses the importance of the attic accesses. "For a long time this upgrade has been undervalued for its budget and importance. We have to accept the fact that home-

owners will go into their attic whether they have a hatch or attic ladder. That is why the upgrade must be made to withstand a lot of wear and tear. As an industry, we must emphasize durability and make it part of the standards. It costs a little more, but the job must be done right for the homeowner to get the expected energy savings."

Vic Alshire, who is the president of Comfort Company in Washington Court House, Ohio, puts it succinctly. "It's really quite simple. Kits are far more cost-effective, but only if they meet all the important standards. You need high R-value, a tight air seal, and long-term durability. In addition, attic ladders and hatches must have protective barriers to keep insulation from entering the living area. The upgrade must have a two-piece design that creates a barrier while also providing access to the attic. Therefore, any single-piece unit is fatally flawed for use in most homes. Any upgrades for attic openings short of all these requirements are just window dressing and a waste of money and time."

"We understood the problem some time ago," says Kevin Soucy, president of Affordable Energy Solutions LLC, in Milford, New Hampshire. "The flimsy solutions used in the industry for years just don't cut it. The upgrades must last as long as the savings are projected. While community action agencies and utility programs are very cost conscious, they still want the projected cost savings to be real. But making an acceptable product with our crews takes a long time."

Existing practice and inertia can be powerful forces to resist change. Fortunately, science clarifies the matter for us. It is instructive regarding the effective R-value calculations, air leakage, SIR calculations, and the interdependency of upgrades. The conclusion is very straightforward.

First, attic ladders and hatches are extremely important. They cause energy loss in both summer and winter. Second, careful scrutiny is needed to ensure that the upgrade for an attic access has the proper design, providing a protective barrier. Third, because the attic access affects other upgrades in a

very significant way, it must conform to higher durability standards than other seemingly similar measures.

In short, upgrades must be durable enough to last 12 or more years, must create a barrier to keep insulation from entering the home, must have an R-value similar to the rest of the attic insulation, and must provide an air seal.

Funding for the upgrades needs to reflect the work and the products necessary to meet more stringent standards. It is increasingly common for agencies to allocate \$175-\$225 for hatches and \$250-\$300 for pull-down ladders. Long-term durability is best achieved through warranted work or products and a commonsense review of the standard that takes wear and tear into account.

A word about the future: Free enterprise has always set the stage to replace individually made products with equal or better ones that can be mass produced. As the contest for better and more cost-effective home energy saving solutions continues, the ultimate winner will be the homeowner and the environment. That's a very good thing to give the next generation.

Jim Melesky is the president of Energy Sentry Solutions, Incorporated of Paoli, Pennsylvania.

For more information:

Contact Jim Melesky at
Tel: (610)993-9585
E-mail:
jmelesky@energysentrysolutions.com
Web site:
www.energysentrysolutions.com

Several attic access kits, including the Energy Guardian, are available that provide a less labor-intensive alternative to individually made upgrades. These kits range in price from \$75 to \$180. Shipping may cost extra, depending on the vendor. The kits vary widely in terms of durability, R-value, design, and ease of installation.

The Energy Guardian™



- The Standard for Attic Ladder & Hatch Upgrades
- R-30 value with tight air seal
- Easy to install kit, Compelling Saving to Investment Ratio
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Call **610-993-9585** or visit:

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Exhibit G

Energy Design Update®

The Monthly Newsletter on Energy-Efficient Housing, from Aspen Publishers

Vol. 23, No. 7

July 2003

INDUSTRY NEWS

Energy Star Labels For Water Heaters

In recent months, the US Department of Energy (DOE) has been seeking input from water heater manufacturers and other "stakeholders" to discuss plans to introduce Energy Star labels for residential water heaters. The DOE hopes to launch the new Energy Star program before January 20, 2004, when more stringent minimum Federal performance standards for water heaters take effect (see *EDU*, February 2001).

As a first step in formulating Energy Star standards for water heaters, the DOE contracted with a consulting firm, D&R International of Salem, Oregon, to outline options for DOE consideration. After D&R's report,

"Energy Star Labeling Potential for Water Heaters," was released for public review in early April, the DOE received a flood of comments from water heater manufacturers and energy-efficiency agencies. (These comments, along with other relevant documents, are posted on the Web at www.energystar.gov/index.cfm?c=new_specs.water_heaters.)

Dividing Appliances Into Categories

There are several technical and political reasons why setting Energy Star standards is far thornier for water heaters than for refrigerators (see "Why There's No Energy Star Program for Water Heaters," *EDU*, October 2001). One problem, the "apples-to-oranges" dilemma, arises from the fact that water can be heated so many different ways: by burning firewood or fossil fuels (usually natural gas, propane, or oil), by electric resistance elements, by air-source or ground-source heat pumps, or by solar thermal collectors. Moreover, water can also be heated by passing it through a heat exchanger connected to a space-heating boiler.

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One suggested solution — establishing different Energy Star standards for different fuels — may confuse consumers. As noted by Bill Kallock, senior project manager at the Vermont Energy Investment Corporation, "An Energy Star program will most likely create the potential for consumers to assume that two Energy Star-labeled units that use different fuels will yield similar cost savings and environmental benefits. This does a disservice to consumers if they choose an Energy Star-labeled unit of one fuel type that ends up costing them more to operate than a non-labeled unit of another fuel type."

ASPEN
PUBLISHERS

Moreover, categorizing water heaters according to fuel type would not necessarily satisfy water heater manufacturers. For example, manufacturers of electric resistance heaters do not want to see their products compared directly with heat-pump water heaters, since their products fare poorly in such a comparison (see Figure 1). For the same reason, manufacturers of gas storage tank water heaters would prefer not to be compared directly to instantaneous gas water heaters.

The D&R Report

According to Richard Karney, the DOE manager in charge of the Energy Star program for water heaters, the D&R International report has his blessing. The report proposes two potential paths or scenarios:

- The first scenario would include best-performing water heaters in each of five categories defined by the DOE, including electric resistance storage water heaters.
- The second approach would exclude electric resistance storage water heaters, but would include at least some water heaters from the following categories: solar water heaters, heat-pump water heaters, instantaneous gas water heaters, gas storage water heaters, and oil storage water heaters.

The first scenario would require, according to the DOE's method of categorization, that water heaters be assigned to one of five different groups, each of which would have a different minimum Energy Factor (EF) for earning an Energy Star label: electric resistance storage water heaters (0.934 EF); heat-pump water heaters (2.4 EF); gas storage water heaters (0.627 EF); gas instantaneous water heaters (0.82 EF); and oil storage water heaters (0.55 EF). The report, following the existing DOE water heater categorization system, suggests that solar water heaters be classified as a type of electric resistance storage water heater, according to the logic that electric resistance elements are the most common backup method for solar

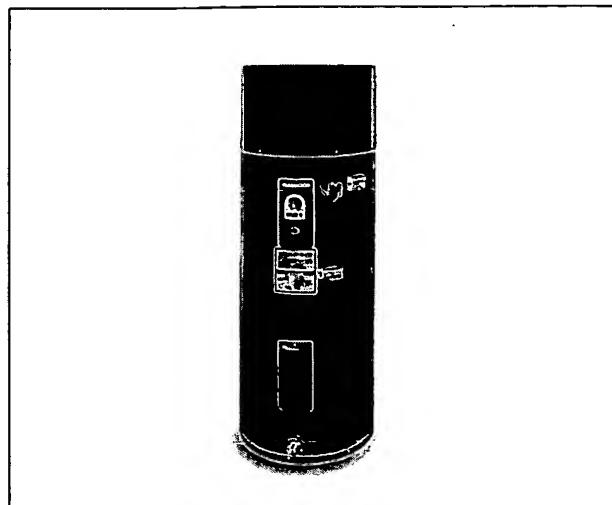


Figure 1. A heat-pump water heater, like this WatterSaver unit from ECR International, removes heat from the air and transfers it to water stored in a tank. Operation of a heat-pump water heater cools and dehumidifies the space in which the water heater is located

water heating systems. (In fact, many solar hot water systems are backed up by gas instantaneous heaters.) Scenario One would allow at least some examples of each of the five types of water heater to be eligible for an Energy Star label.

The DOE's proposed categories have drawn criticism. According to Charles Stephens, policy analyst at the Conservation Division of the Oregon Office of Energy, "The Department [of Energy] seems determined to arbitrarily subdivide the equipment choices into smaller compartments than is justified. First there's the fuel subdivision, which is admittedly common. Then there's the storage versus instantaneous subdivision. And then the renewable versus non-renewable subdivision, which seems to be why solar finds itself fitting so uneasily into the picture.... The proposed distinction between electric resistance and heat-pump water

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heaters, and between storage-type and instantaneous natural gas-fired water heaters, is highly inappropriate. While there are certainly application issues associated with the more advanced technologies, as always, the relative efficiencies, as measured by the Energy Factor, are absolutely an indicator of a consumer's annual energy bills for heating water with each type."

The "inappropriate" distinctions highlighted by Stephens would have the effect of favoring manufacturers of electric resistance storage heaters and gas storage heaters. Of course, most manufacturers of instantaneous water heaters would prefer to see their products judged against all other gas-burning water heaters. "The question should simply be, How much fuel does the product use to produce the hot water demanded?" notes John Confrey, product development and marketing manager at Noritz America, a manufacturer of instantaneous heaters. "I feel that holding instantaneous water heaters to a higher standard than storage tank water heaters will be detrimental to the growth in usage of these highly efficient products, which seems to go contrary to Energy Star's intent."

Solar Equipment Is Electric Equipment

Many commenters are scratching their heads over the DOE contention that solar water heaters are a type of



Figure 2. According to the Department of Energy, solar water heaters, like this collector from Heliodyne, should be categorized as electric water heaters.

electric water heater (see Figure 2). "The paper prepared for DOE proposes that solar systems be considered a subset of electric resistance systems," writes Harvey Sachs, Buildings Program Director at the American Council for an Energy-Efficient Economy. "The ACEEE believes that this sends a message that electric resistive systems can be very efficient. We strongly prefer to treat solar water heating as its own class, rated and qualified on the basis of performance of the solar collector and the rest of the system."

Table I — Payback Analysis

Product Category	Cost for Products Meeting Minimum Federal Standard	Cost for Products Meeting Proposed Energy Star Standards	Incremental Cost	Estimated Annual Cost Operating Savings	Approximate Payback Period (years)
Gas storage	\$270	\$380	\$110	\$14	8
Gas instantaneous	\$900	\$1,100	\$200	\$36	6
Electric Storage	\$280	\$380	\$100	\$12	2
Solar (compared to electric storage)	\$430	\$5,090 installed	\$4,660	\$257	18
Heat pump (compared to electric storage)	\$430	\$1,350 installed	\$920	\$255	4

Table I. The figures in this payback analysis come from "Energy Star Labeling Potential for Water Heaters," a report prepared for the Department of Energy by D&R International of Salem, Oregon.

In his own comments to the DOE, Charles Stephens was more blunt. "DOE is determined to lump [solar water heating systems] in with the electric technologies. Why is this?" Stevens asks. "We are completely at a loss to understand why the Energy Star program is determined to include this type of system, when by the criteria used to judge the other technologies, it clearly doesn't fit. Except, of course, in its own fuel class, like the others."

Analyzing Payback

The D&R report calculates the payback periods for the incremental cost of five types of water heaters complying with proposed Energy Star standards (see Table 1, page ?). These payback periods range from two years (for the \$100 incremental cost of an efficient electric resistance storage water heater) to 18 years (for the \$4,660 incremental cost of a solar water heating system compared to an electric resistance storage water heater). The report did not include a payback analysis for instantaneous gas water heaters.

In light of the long payback period for solar water heaters, Glenn Reed, a residential program manager for Northeast Energy Efficiency Partnerships, questioned whether solar systems should even be considered for Energy Star eligibility. "If DOE's cost and savings assumptions regarding solar water heaters are correct, then DOE should consider what it wants to convey to a potential purchaser by qualifying these products with an Energy Star label," wrote Reed. "While solar hot water heaters do save significant energy, an 18-year payback seems excessive — and this is compared to a conventional electric water heater."

However, Bion Howard, president of Building Environmental Science and Technology in Edgewater, Maryland, doubts the validity of D&R's 18-year payback calculation, in light of the high equipment cost on which the calculation is based. "Reviewing the price points used by D&R International, my reaction was that ten-year-old pricing figures [for solar systems] have crept in," wrote Howard. "There are complete [solar] systems with robust consumer warranties available now for about \$3,500 installed, not \$5,000 plus."

The payback analysis for heat-pump water heaters is also open to question, since it assumes an Energy Factor of 2.37. Field studies of heat-pump water heaters have shown significantly lower efficiencies. For example, researchers in Connecticut hoped that the 30 heat-pump water heaters enrolled in a 2001 study would have an average coefficient of performance (COP) of 2.25; instead, the units had an actual average COP of 1.69 (see "Northeast Utilities Field Study Gives

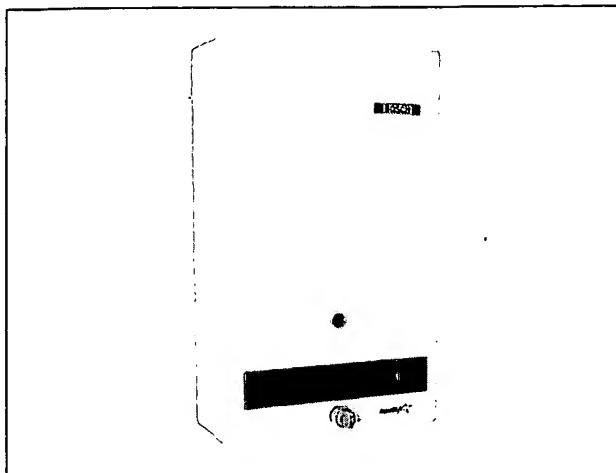


Figure 3. As currently envisioned, the Energy Star program for water heaters would require instantaneous gas water heaters, like this model from Bosch Aquastar, to meet a higher efficiency standard than gas storage water heaters.

Crispaire HPWH Very Mixed Reviews," *EDU*, December 2001).

Treating Instantaneous Gas Heaters Fairly

According to the DOE proposal, gas storage water heaters would not be compared directly with instantaneous gas water heaters. While gas storage units would need an EF of only 0.627 to earn an Energy Star label, instantaneous units would need an EF of 0.82 (see Figure 3). According to George Penn of Global Energy Options in Madison, Wisconsin, "Comparing heat-pump water heaters and solar water heating [systems] to storage electric water heaters while not comparing on-demand gas water heaters to gas storage water heaters ... illogically places on-demand gas water heaters in a disadvantaged position."

Mary Moffroid, president of Controlled Energy Corporation, a distributor of instantaneous gas water heaters, would prefer that the Energy Star bar for gas instantaneous heaters be lowered. "Setting the [proposed] EF [for Energy Star instantaneous gas water heaters] at 32% above the Federal minimal standard of .62 is excessive," wrote Moffroid. "According to the DOE Office of Energy Efficiency and Renewable Energy, 'Energy Star-labeled appliances exceed existing Federal efficiency standards, typically, by 13% to 20%.' And yet the proposed Energy Star standard for instantaneous water heaters (.82) would exceed the Federal minimum standard (.62) by 32%. A more typical 20% increase would have an Energy Star threshold set at .75. (Note that proposed Energy Star gas storage tanks would exceed Federal minimum standards by 7%, electric storage tanks by 3%)."

Indirect Water Heaters are Missing

The D&R report makes no mention of indirect water heaters, which are commonly installed in new homes in New England, where hydronic heat dominates. This may be due to the fact that there is no agreed-upon method to rate the efficiency of indirect water heaters, which need to be rated as a system, not as an appliance. "How will indirect water heaters (from a boiler) be considered?" wonders Joe Swift, a program planner at Northeast Utilities in Berlin, Connecticut. "This [DOE proposal] will possibly encourage contractors and consumers to install a separate Energy Star water heater along with a boiler, even though an indirect off-the-boiler [tank] may be (and probably is) the preferred option for the consumer."

Little Room for Differentiation

While instantaneous gas water heaters dominate the residential market in Europe, the US water-heater market is overwhelmingly dominated by electric and gas storage heaters. When comparing the least efficient to the most efficient storage water heaters, one is struck by the limited range (see Table 2). Once the new Federal standards take effect next year, available electric storage water heaters will have Energy Factors (EFs) ranging from 0.90 to 0.95, while gas storage water heaters will have a EF ranging from 0.59 to 0.65.

According to many observers, this range is too narrow to justify establishing an Energy Star program for storage water heaters, especially since the Energy Star label is usually reserved for appliances that perform 13%–25% better than typical unlabeled appliances. Consumers looking for dramatic improvements in water-heating efficiency will not find it among storage

water heaters, even if they select the best available models. Instead, they will need to choose from technologies that now make up only a narrow slice of the market: instantaneous gas water heaters, heat-pump water heaters, and solar water heaters.

Harvey Sachs urged the DOE to exclude electric resistance water heaters from any Energy Star program. "There should be no program for technologies where the range of available efficiency ratings is less than about 10%," he writes. "The small potential savings for consumers from products in such categories threaten the Energy Star program's brand equity as a symbol of products that provide significant energy savings. For this reason, ACEEE opposes an Energy Star program for resistance water heaters."

Ted Williams, director for Codes, Standards & Technical Support at the American Gas Association, agrees with Sachs on this point. "Proposed minimum efficiencies for Energy Star labeling of electric storage water heaters would offer insignificant energy savings and misleading information to consumers," wrote Williams. "As DOE heard at the April 16 meeting, an Energy Star labeling energy factor (EF) of 0.93 over a 2004 minimum efficiency of 0.90 (both for a 50-gallon storage water heater), saves little energy and, as one participant stated, may 'cheapen the image of Energy Star' by not providing energy and operating cost savings commensurate with other Energy Star Labeled products or even other residential water heater technologies."

Excluding Electric Resistance Heaters

The D&R report presents the argument in favor of excluding electric resistance water heaters in its second

Table 2 — Energy Factor (EF) of Storage Water Heaters

	Gas storage water heaters	Electric storage water heaters
Current Federal minimum (EF)	0.54	0.86
2004 Federal minimum (EF)	0.59	0.90
Proposed Energy Star standard (EF)	0.627	0.934
Best available equipment (EF)	0.65	0.95

Table 2. Once new Federal minimum standards for water heaters take effect on January 20, 2004, only a relatively narrow range will separate the performance of the worst available storage water heaters from those meeting the proposed Energy Star standard. In contrast, the Energy Factor (EF) of some gas instantaneous water heaters exceeds 0.82, while the EF of some heat-pump water heaters is over 2.

scenario. According to the report's authors, "The savings of advanced [heat pump and solar] water heater technologies over a conventional electric resistance water heater per installation may be in the range of 3,000 kWh annually. This tremendous savings potential is much greater than the typical 100 kWh annual savings estimated by simply using the better performing electrical resistance water heater. Even at 1% market share, the advanced technologies national energy savings contribution is dramatically improved."

The argument for Scenario Two is bolstered by the fact that heating water with electric resistance is very expensive in most areas of the country. "An electric Energy Star water heater will probably (in most cases) cost more to operate than a fossil fuel non-Energy Star water heater," wrote Joe Swift. "Yet [under Scenario One] the customer may be likely to choose the electric heater because of the [Energy Star] label, even though it may not be in their best interest."

Anne Wilkins, Senior Program Manager for the Office of Energy Efficiency at Natural Resources Canada, argues in favor of excluding most gas storage water heaters as well. "Standard gas storage water heaters tanks should be excluded from the mix because the Energy Factor for these units max at about 65%," she wrote. "There could be some advantage to considering direct vent/sealed combustion units which prevent the space heating losses up the flue."

Are Heat-Pump Water Heaters Dependable?

The most efficient available water heaters — including solar, gas instantaneous, and heat-pump water heaters — cost more and require more maintenance than common gas or electric storage water heaters. As noted by Glenn Reed, the residential program manager for Northeast Energy Efficiency Partnerships, "Utilities in the Northeast have been running heat-pump water heater R&D projects for well over a decade. Reliability concerns remain." Because of these concerns, the D&R report notes that it "may be premature" to include these technologies in an Energy Star program.

Yet for Harvey Sachs, the potential energy savings from switching to heat-pump water heaters justify the initial investment and possibly higher maintenance costs. "The savings from new residential water heating technologies at low market penetration rates dwarf those from modest improvements to existing storage technologies," wrote Sachs. "Therefore, the focus of an Energy Star program should be transforming the market toward these new technologies ... ACEEE strongly recommends launching a program for heat-pump

water heaters. As shown by the Department's own analysis, the potential savings, even at modest market penetration rates, dwarf those of other technologies."

Brad Hollomon from the Pacific Northwest National Laboratory notes that D&R's report may underestimate the potential energy savings from solar and heat-pump technology. "Just as compact fluorescent lights don't pay for themselves in closets where they are used for only a few minutes a day, heat-pump and solar water heaters are attractive primarily where hot water use and electric rates are high, and other options are not available," wrote Hollomon. "If one credits consumers with the good judgment to buy heat-pump and solar water heaters preferentially for applications where they make the most economic sense, the energy (and corresponding cost) savings will be higher than the 1,095 billion Btu in national savings predicted.... Using national averages for water use, etc., to characterize the impact of the advanced technologies understates their impact."

Missing: Systems Thinking

According to some analysts, including Bion Howard, the DOE is setting its sights too low. Rather than merely labeling pieces of equipment, Energy Star should develop a program to rate residential hot water *systems*, in the same way that HERS raters certify Energy Star homes. Only then will it be possible to include credit for such features as drain-water heat recovery, piping efficiency, and indirect water heaters, none of which are mentioned in the D&R report (see "Designing a 'Green Bundle' Water Heating System," *EDU*, March 2001). Advocates of rating systems instead of appliances note that the efficiency improvements to be gained by installing home-run PEX tubing and GFX drain-water heat recovery systems should not be ignored, since they represent cost-effective "low-hanging fruit."

A Taboo Against Switching Fuels

In addition to the technical hurdles faced by the DOE, the agency is also hobbled by political considerations. For the subset of US consumers who are interested in energy savings, the main motivation is saving money. For some consumers, the easiest way to lower water heating bills is to switch fuels — in most cases, from electricity to natural gas. But according to DOE's Richard Karney, fuel switching considerations are taboo at the DOE. "We're not going to be talking about fuel switching," he says. "Historically, we have never advocated fuel switching, throughout the Federal standard-setting processes. Even though Energy Star is a voluntary program, we won't go there. That is one of the agreements the Department has made with the gas industry and the electrical industry."

Considering the tangle of issues barring the way to a successful Energy Star program for water heaters, some critics wonder whether the program would even have any benefit to consumers. "Water heaters already have easy-to-read, easy-to-understand Energy Guide labels," notes Joe Swift. "Why fix it if it's not broken?"

An Ambitious Timetable

Richard Karney, undeterred by the daunting nature of his assigned task, is determined to establish an Energy Star program for water heaters. "Originally we hoped to release initial Energy Star criteria for public comment at the beginning of June," he says. "Now we're

looking at the end of June or the beginning of July. At that time we'll release proposed criteria for review and comment. We will conduct a stakeholders' meeting toward the end of August in Washington. For the release of the final criteria, we're still shooting for October 1st. We'd like to give the industry a couple of months to gear up before any Energy Star guidelines take effect in January 2004, coinciding with the new Federal standard."

For more information, visit www.energystar.gov/index.cfm?c=new_specs.water_heaters, or contact Richard Karney at richard.karney@ee.doe.gov.

Canadian Energy Star Window Standards Finalized

After floating a draft proposal and soliciting comments from stakeholders, Natural Resources Canada in late April published its criteria for Energy Star windows and sliding glass doors in Canada (see *EDU*, May 2003). The final version of the criteria is somewhat less stringent than the earlier draft proposal.

For the purposes of Canada's Energy Star window program, Canada has been divided into four climatic zones. (In the earlier draft, only three zones were proposed; the final version includes a new Zone D in the far north.) The four zones are defined by heating degree days (see Table 3).

In Canada, the Energy Star windows program will be phased in gradually over the next two years; full implementation will occur until April 1, 2005. In the interim, two transitional periods will be recognized. From now until March 31, 2004, any window that qual-

ifies for an Energy Star label in the northern zone of the US (i.e., a window with a maximum U-factor of 0.35) may be promoted as an Energy Star window in Canada. From April 1, 2003 until March 31, 2005, windows sold in Canada cannot be labeled as Energy Star windows unless they comply with one of two compliance paths. The first path includes a maximum U-factor and maximum air leakage levels; the second path requires a minimum Energy Rating (see Table 4).

Full implementation of the Energy Star window program in Canada begins on April 1, 2005. At that time, the criteria are ratcheted up a notch (see Table 5).

For more information, contact Steve Hopwood, Office of Energy Efficiency, Natural Resources Canada, 615 Booth Street, 4th Floor, Ottawa, Ontario K1A 0E4, Canada. Tel: (613) 995-6741; E-mail: shopwood@nrcan.gc.ca.

Table 3 — Climatic Zones for Canadian Energy Star Windows

	Cities	Heating Degree Days
Zone A	Vancouver	Less than 6,300
Zone B	Toronto, Montreal, Quebec City	6,300 to 10,000
Zone C	Edmonton, Saskatoon, Winnipeg	10,000 to 14,500
Zone D	Yellowknife, Churchill	Over 14,500

Table 3. In the final version of the Canadian Energy Star window criteria, Canada has been divided into four climatic zones.

Table 4 — Interim Criteria for Canadian Energy Star Windows

	Maximum Air Leakage (m ³ /h)/m	and	Maximum U-factor for Energy Star Windows	or	Minimum ER for Operable Energy Star Windows	Minimum ER for Fixed Energy Star Windows
Zone A	1.65	and	0.35	or	-16	-6
Zone B	1.65	and	0.33	or	-13	-3
Zone C	1.65	and	0.30	or	-10	0
Zone D	1.65	and	0.25	or	-5	+5

Table 4. Windows sold in Canada will be able to meet Energy Star standards by either of two compliance paths. The first path includes maximum values for U-factor and air leakage, while the second path requires a minimum Energy Rating (ER). The values shown in this table are interim values to be used during the phase-in period from April 1, 2004 until March 31, 2005.

Table 5 — Final Canadian Energy Star Window Criteria

	Maximum Air Leakage (m ³ /h)/m	and	Maximum U-factor for Energy Star Windows	or	Minimum ER for Operable Energy Star Windows	Minimum ER for Fixed Energy Star Windows
Zone A	1.65	and	0.35	or	-16	-6
Zone B	1.65	and	0.32	or	-12	-2
Zone C	1.65	and	0.28	or	-8	+2
Zone D	1.65	and	0.25	or	-5	+5

Table 5. On April 1, 2005, the criteria shown above will take effect.

NEWS BRIEFS

CAMBRIDGE, MA — The Union of Concerned Scientists, in a report that grades state governments on their support for renewable energy, has given its highest mark, an A minus, to California and Nevada. Three other states — New Mexico, Massachusetts, and Minnesota — received honorable mentions by earning B's. The thirteen states tying for last place — Alaska, Colorado, Indiana, Kentucky, Maryland, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, Utah, and West Virginia — all received F's. "Renewable electricity can provide future generations with safe and cost-effective domes-

tic energy sources," said Jeff Deyette, UCS analyst and co-author of the new report, *Plugging in Renewable Energy: Grading the States*. "But only five states are carrying the ball for the entire nation. It is time for the federal government to enact a fair national standard to improve our country's energy security and environment." To see how all 50 states were graded, visit www.ucsusa.org/news.cfm?newsID=343.

PHOENIX, AZ — Arizona Governor Janet Napolitano has signed into law a new bill, HB 2324, requiring

buildings owned by state agencies and universities to achieve a 15% reduction in energy use per square foot of floor area by 2011. The legislation also requires that all appliances purchased by the state be Energy Star-compliant. According to the Southwest Energy Efficiency Project (SWEET), the bill will lower energy costs at state facilities by \$90 million during the 12 years from 2004 to 2015. "With the passage of HB 2324, state government will be doing its part," said Howard Geller, SWEET's executive director. "Now it is time to expand energy efficiency policies and programs for households, businesses, and industry in Arizona."

PARIS, FRANCE — Electrical appliances are the fastest growing energy users after automobiles, according to a study released by the International Energy Agency. Appliances account for 30% of electrical consumption in the countries surveyed (i.e., members of the Organization for Economic Cooperation and Development). The number of appliances per capita is increasing, and electrical consumption for appliances is expected to grow 25% by 2025. The fastest growing electrical appliance end-use is phantom loads — that is, standby power consumption by appliances that appear to be "off." According to the study, "Cool Appliances: Policy Strategies for Energy-Efficient Homes," additional appliance efficiency gains of up to 30% are possible. The report calculates that government programs targeting the lowest life-cycle cost for residential appliances could result in reductions of carbon dioxide emissions equivalent to 30% of Kyoto Protocol goals, saving money in the process. According to the report, the average North American household consumes 2.4 times the electricity of the average European household. The report can be purchased for 75 Euros at www.iea.org/books.

CAMBRIDGE, MA — Efficiency Vermont, the country's first ratepayer-funded energy-efficiency utility, was one of five 2003 winners of the Innovations in American Government Award. The honor, which is awarded by Harvard University's John F. Kennedy School of Government, identifies and promotes excellence and creativity in the public sector. Efficiency Vermont provides rebates for the purchase of energy-efficient products, energy-saving services for low-income Vermonters, and technical and financial assistance for the construction of energy-efficient homes. Efficiency Vermont calculates that over the last three years, its programs have saved 99,000 megawatt-hours of electricity, equivalent to the power generated by three hydroelectric dams on Vermont's Winooski River.

WASHINGTON, DC — US senators were still debating their version of the energy bill, S 14, as this issue of *EDU* went to press. According to the American Council for an

Energy-Efficient Economy (ACEEE), the bill under consideration "falls far short of the energy efficiency policy measures needed to make a real difference for America's energy security, economic recovery, and environmental sustainability." According to Steven Nadel, ACEEE's executive director, "The Senate bill contains worthwhile appliance standards and tax credits for advanced efficiency technologies, but it fails to make a real dent in our oil dependence or electricity use."

NEW YORK, NY — A multifamily apartment building on Roosevelt Island in New York's East River, the Octagon Building, will soon be retrofitted with 50 kW of photovoltaic (PV) modules, enough to power the buildings' mechanical systems, elevators, and common areas. The 500-unit apartment complex will also receive insulation improvements, a cogeneration plant, and a new heating system using ground-source heat pumps. The cost of the PV system is being subsidized by a \$250,000 grant from the New York State Energy Research and Development Authority.

WATERLOO, ONTARIO — Arise Technologies, a Kitchener, Ontario engineering and development company, announced that Cook Homes has completed the first of 15 planned photovoltaic-equipped homes in a new subdivision in Waterloo. About one-third of the \$42,000 (Canadian) cost of each home's PV system will be covered by a grant from the Canadian government's Climate Change Action Fund.

HELENA, MT — Montana Governor Judy Martz has signed legislation assuring the continuation of the state's public purpose funding (also known as the system benefits charge) through 2005. According to ConWeb, a monthly online newsletter produced by Energy NewsData in Seattle, the legislation guarantees that 2.4% of utility revenues will be used to support energy-saving, renewable energy, and low-income programs. Currently, Montana's system benefits charge generates \$13 million annually, 17% of which is earmarked for low-income weatherization assistance.

BRUSSELS, BELGIUM — European markets have the potential to increase the number of installed residential solar thermal systems by a factor of 100, according to "Sun in Action II," a recent report issued by the European Solar Thermal Industry Federation (ESTIF). "Solar thermal has grown by 11.7% per year over the past decade," notes ESTIF president Ole Pilgaard, "and still the technical potential for this clean technology is largely untapped." According to the report, regulations in some European cities, including Barcelona, already require the installation of solar thermal systems in new res-

idential construction. Over 80% of the existing solar thermal systems in Europe are found in only three countries: Germany, Greece, and Austria. The complete ESTIF report is posted on the Web at www.estif.org/11.0.html.

SYDNEY, AUSTRALIA — A technical manual for green residential construction, *Your Home*, has received the Environmental Leadership in Communications Award, an annual prize awarded by the Banksia Environmental Association in Australia. *Your Home*, a technical design guide for the residential construction industry and Australian homeowners, includes information on insulation, glazing, photovoltaics, passive solar design, and the selection of energy-efficient appliances. The book was produced by the Institute for Sustainable Futures at the University of Technology in Sydney, and is being distributed by the Australian Greenhouse Office. *Your Home* is posted on the Web at www.yourhome.gov.au.

WASHINGTON, DC — US wind generation capacity is expected to increase 25% in 2003, according to an estimate from the American Wind Energy Association. By the end of the year, new generation capacity of 1,100 to 1,400 megawatts will boost the total US wind capacity to 6,000 megawatts. Among the wind projects scheduled for 2003 is a 750-kW installation in South Dakota, where the Rosebud Sioux tribe will be installing wind turbines to provide 80% of the needs of the Rosebud Casino. For more information, visit www.awea.org/projects/index.html.

WASHINGTON, DC — Lawn tractors are becoming "America's new SUV," according to an April 24 article in the *Washington Post*. The article takes note of two concurrent trends: the average size of US lawns is shrinking, while the average horsepower of lawnmowers continues to rise.

TOKYO, JAPAN — Photovoltaic (PV) module manufacturer Mitsubishi Electric plans to increase its production capacity by 50% in 2003, according to an article on Solarbuzz.com, a solar energy Web site. Mitsubishi reports that sales of their PV modules are increasing rapidly in North America and China.

WATSONVILLE, CA — Homeowners have begun moving into new homes at Vista Montana, described as the largest development of zero-energy homes in the US. According to

a May 18 article in the *San Francisco Chronicle*, each Vista Montana home is equipped with a 2-kW photovoltaic (PV) system, expected to meet about 60% of the average family's needs. When completed in 2005, the project, developed by Palo Alto builder Clarum Homes, will have 257 homes priced at \$340,000 to \$480,000. Clarum Homes vice president John Suppes estimates that each home's energy-saving features add \$20,000 in construction costs. According to the *Chronicle* article, Debora Lichliter, director of marketing at rival Centex Homes, doubts that the average home buyer cares about energy efficiency. Lichliter is quoted as saying, "It seems the average person really wants their granite countertops."

SUNNYVALE, CA — The SunPower Corporation has announced the production of a new 3-watt photovoltaic (PV) cell, the A-300, that converts sunlight to electricity at an efficiency of 20.4%. The cell's efficiency has been verified by the National Renewable Energy Laboratory in Golden, Colorado. SunPower is gearing up to produce large quantities of the new PV cells in 2004. For more information, visit www.sunpowercorp.com.

SACRAMENTO, CA — A bill requiring every new California home to include a 2.4-kW photovoltaic (PV) system has gone down to defeat. The legislation, Senate Bill 289, was heavily opposed by the residential construction industry. According to an article in the *Sacramento Bee*, Republican Senator Dick Ackerman said, "Solar power is not there yet. The real solution to the energy crisis is to build more power plants."

CANBERRA, AUSTRALIA — The Australian government has decided to extend its rebate program for new photovoltaic (PV) systems for another two years. According to a news article on Solarbuzz.com, a solar energy Web site, the government sees the PV rebate program as an important element of Australia's commitment to reducing greenhouse gas emissions.

LADERA RANCH, CA — Construction has begun at Terramor, one of the largest green developments in the country. According to developer Rancho Mission Viejo, the project in Ladera Ranch will eventually include 1,260 photovoltaic-equipped Energy Star homes priced at \$250,000 to \$700,000 each.

RESEARCH AND IDEAS

Blowing Polystyrene Beads

In many areas of the Northeast, older brick homes have exterior walls built of several wythes of structural

brick. The interior finish typically consists of lath and plaster installed on vertical furring strips (often mea-

suring a full 1 inch in thickness) attached to the brick-work. For weatherization contractors, insulating such walls is a challenge, since cellulose does not flow well in shallow cavities.

In Europe, such cavities are often filled with polystyrene beads; in some cases the polystyrene is mixed with an adhesive to bind the beads together after installation. Although polystyrene beads, known as "prepuff" in the polystyrene industry, are not sold in the US for use by insulation contractors, the material may be available from some manufacturers of polystyrene products (e.g., food coolers).

Dumpster Diving

One of the US pioneers of polystyrene-bead blowing is Daniel Stewart, who developed techniques for insulating shallow wall cavities in the Philadelphia area in the early 1990s. Stewart collected his raw material, polystyrene blocks used in shipping, from appliance-store dumpsters. He took the discarded polystyrene and ground it up in a garden chipper-shredder. "It didn't grind the polystyrene fine enough, so I modified the shredder by attaching a 1/4-inch hardware-cloth screen at

the outlet. The screen held the material in the shredder longer." Stewart installed the beads using a modified cellulose blower. "At first, the polystyrene beads wouldn't flow through the hopper. It needed more air. I had to design a hopper that allowed both air and the polystyrene beads in. Eventually I developed my own hopper made out of a trash can." Stewart was pleased with the results, noting that "polystyrene beads flow extremely well."

Vic Aleshire, a weatherization contractor in Washington Court House, Ohio, began insulating cavities with polystyrene beads after learning the technique from Stewart. "We use a high air feed but a low volume material feed," says Aleshire. "We adjust the air on our Krendl machine to blow at number 8, but we adjust the slide gate for the material feed to only one-eighth the normal rate used for cellulose." At the top of a wall cavity, Vic leaves a small air space, and compresses the beads using his hand or a stick. He then fills the last few inches of the cavity with two-part urethane spray foam.

For more information, contact: Daniel Stewart, Energy Innovations, P.O. Box 1823, El Prado, NM 87529. Tel: (505) 776-8978; E-mail: stewart@taosnet.com.

NEW PRODUCTS

Insulating Attic Hatches and Stairs

Even in new homes, attic access hatches and pull-down attic stairs are rarely well-insulated or equipped with adequate weatherstripping. Of course, many builders make their own attic access hatches by gluing rigid foam to plywood, or from pieces of structural insulated panels. For those looking for ready-made solutions to plug the attic-access energy hole, at least four manufacturers produce useful products.

Resource Conservation Technology's Access Hatch

Resource Conservation Technology sells a ready-made attic access hatch (\$165), including a finished frame, for installation in a rough opening measuring 22 3/4 by 44 1/4 inches. The panel has a 2-inch-thick core of expanded polystyrene (R-10), faced with hardboard on top and white plastic laminate on the bottom. The hatch includes foam weatherstripping and a multi-point latch that draws the hatch tight to the gasket.

The Attic Tent

A North Carolina company called Insulsure sells an insulating cover for pull-down attic stairs called the Attic Tent (see Figure 4). The Attic Tent is made of flexible 1/2-inch

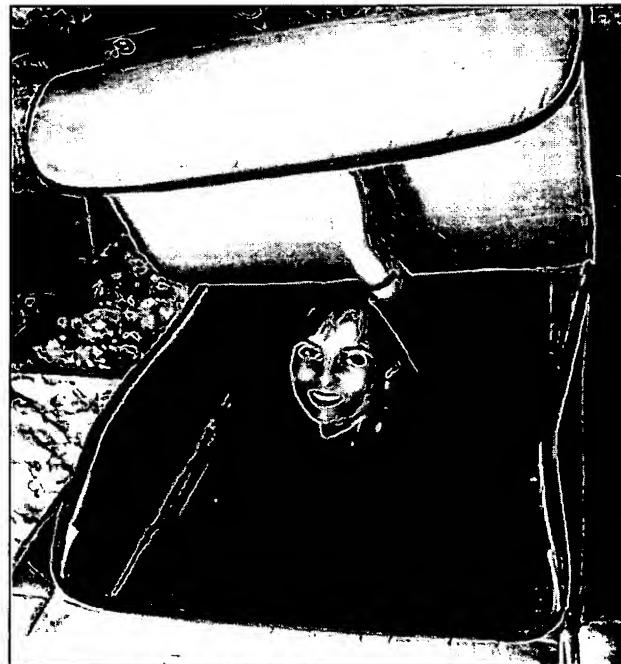


Figure 4. The Attic Tent is a flexible insulating cover for pull-down attic stairs with an R-value of 3.2.

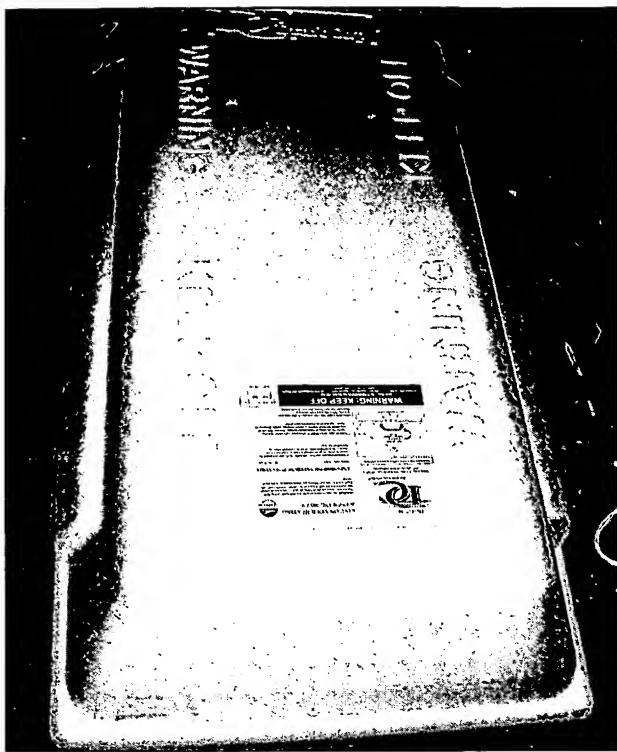


Figure 5. Designed to be installed on top of pull-down attic stairs, the Draft Cap is made of $2\frac{1}{4}$ -inch-thick expanded polystyrene with an R-value of 12.



Figure 6. The R-28 Energy Guardian costs more than the Draft Cap, but is stronger and provides a higher insulating value.

polyurethane foam covered with nylon fabric, and is installed by stapling a fabric flange to the top of the stair's rough opening. After stapling the unit in place, the seam can be caulked for increased air tightness. According to the manufacturer, the Attic Tent has an R-value of 3.2.

Insulsure contracted with Advanced Energy of Raleigh, North Carolina to study how the Attic Tent improved the air tightness of stair openings in five houses. According to a report by Advanced Energy's Arnie Katz, the air leakage through the attic stair openings before installation of the insulating covers varied from 71 to 159 cfm @ 50 pascals. With the Attic Tents installed, the air leakage dropped to a range of 49 to 53 cfm @ 50 pascals.

The Attic Tent comes in five different sizes: 22" x 54" x 7" (\$99.95), 25" x 54" x 7" (\$99.95), 22" x 54" x 13" (\$109.95), 25" x 54" x 13" (\$109.95), and 30" x 60" x 13" (\$119.95). In quantity, Attic Tents can be purchased from the manufacturer for as little as \$59.95 each.

The Draft Cap

Atticap Corporation makes a cover for pull-down attic stairs called the Draft Cap (\$100). Measuring 31 by 59 $\frac{1}{2}$ inches, with a height of 7 $\frac{3}{4}$ inches, the Draft Cap fits over a 25 $\frac{1}{2}$ by 54 inch rough opening (see Figure 5). The R-12 cap is made of $2\frac{1}{4}$ -inch-thick expanded polystyrene (1.5 pounds per cubic foot density). It is designed to sit on top of the attic floor joists or the attic subfloor, and is deep enough to accommodate most stairs, even if the attic joists are shallow 2x6s. According to the manufacturer, the Draft Cap is "not designed to bear weight."

The Energy Guardian

A company called Energy Sentry Solutions makes the Energy Guardian, an insulating cap that comes in a variety of sizes to fit over attic access hatches or pull-down stairs (see Figure 6). (The access hatch cap is a secondary cap that assumes the existence of a primary hatch below.) The Energy Guardian has more than twice the R-value of, and is significantly stronger than, the Draft Cap.

Each R-28 Energy Guardian cap comes with a polystyrene frame designed to be installed on top of the attic floor joists or attic subfloor; the cap has a rabbet that matches the frame, but no weatherstripping. The frame is assembled with double-sided tape, although most installers will probably want to seal the corners with caulk or expanding foam.

Both the cap and the frame are made of $6\frac{1}{4}$ -inch-thick high-density (2 pounds per cubic foot) expanded polystyrene finished with fire-retardant paint. The caps

come with rugged metal handles mounted on the bottom to make them easy to raise and lower.

The cap for access hatches comes in two sizes. The square cap (\$139) measures 38 by 38 inches (with an inside dimension of 32 by 32 inches), while the rectangular cap (\$135) measures 30 by 36 inches (inside, 24 by 30 inches). The cap for pull-down stairs (\$220) measures 36 by 66 inches (inside, 26 by 56 inches). The Energy Guardian is available from Energy Federation Inc.; large quantities can be ordered direct from the manufacturer, Energy Sentry Solutions.

For more information, contact:

Atticap Corporation, P.O. Box 51, Newton, MA 02464. Tel: (888) 292-2229; E-mail: paulp@draftcap.com; Web site: www.draftcap.com.

Slow Rise Polyurethane Foam

Fomo Products, a manufacturer of two-component polyurethane foam, has introduced a new product, Handi-Foam Slow Rise, for use in enclosed cavity fill applications (see Figure 7). Fomo calls Slow Rise a "pour-in-place" foam to distinguish it from their conventional "spray-in-place" product.

Handi-Foam Slow Rise takes 60 to 90 seconds to rise and become tack-free. Although the product is intended for use in cavities, installing it in existing walls can be tricky. As the installation instructions warn, "There will be mold pressure exerted by any pour-in-place foam in nearly all applications. Therefore all molds need to be clamped or braced in some way."

Weatherization contractors interested in using Slow Rise will need to proceed with caution. According to Paul Hurray, a technical manager at Fomo, "The pressure exerted varies, but can be up to 5 psi. Most types of OSB and plywood should be strong enough to withstand the pressures exerted without perceptible bowing, but if the flow is obstructed or restricted, or if too much foam is used — what we call overpacking the cavity — then the foam will exert higher pressure, and that is when you can start popping things. I say 'imperceptible bowing,' but 'imperceptible' depends on who is perceiving it. With drywall, even a slight bow may be perceptible by some people, especially if the foam is installed in a wall cavity after the drywall is taped and mudded. You need to know the dimensions of the cavity that you're putting the foam into, and you need to know whether there are any obstructions. If you're unsure, you can put

Energy Federation Incorporated (EFI), 40 Washington Street, Suite 3000, Westborough, MA 01581-1013. Tel: (800) 876-0660 or (508) 870-2277; Fax: (508) 870-9933; E-mail: info@efi.org; Web site: www.efi.org.

Energy Sentry Solutions, P.O. Box 400, Paoli, PA 19301. Tel: (610) 993-9585; Fax: (610) 640-1378; Web site: www.energysentrysolutions.com.

Insulsure, P.O. Box 553, Mount Mourne, NC 28123. Tel: (877) 660-5640; E-mail: steve.williams@insulsure.com; Web site: www.insulsure.com.

Resource Conservation Technology, 2633 North Calvert Street, Baltimore, MD 21218. Tel: (410) 366-1146. E-mail: leejaslow@pondtechnology.com. The company has no Web site.

more holes in the wall and make smaller fills. You start two feet from the bottom, let the foam rise up to the hole. It only takes a couple of minutes. Then you can move up to a hole two feet higher up the wall."

Peter Robinson, a sales representative for Great Northern Products in Exeter, New Hampshire, provides Slow Rise foam to weatherization contractors. "If you are spraying into cavities and you don't know what's there, you may need to be cautious," says



Figure 7. Handi-Foam Slow Rise is a two-component urethane foam designed to be poured into enclosed cavities. The foam expands fully within a minute and a half.

Robinson. "In an old building it's always a good idea to get an electrical fish wire and see what you have in the stud cavity before you spray the foam, to see if you have blocking or obstructions. You can also experiment someplace in a closet before you do a regular section of wall. It's best to be conservative."

According to Robinson, many SIP installers are switching from conventional two-component polyurethane foam to Slow Rise. When used to fill gaps between SIP panels, Slow Rise foam flows farther into hidden cavities than regular foam before it expands.

Handi-Foam Slow Rise costs between \$12 and \$21 a

cubic foot. It is available from J & R Products in three sizes: 7.6 cubic feet (\$160), 13 cubic feet (\$250), and 43.7 cubic feet (\$525).

For more information, contact:

J & R Products, 4695 East 200 North, Craigville, IN 46731. Tel: (800) 343-4446 or (219) 565-3600; Fax: (219) 565-3826; Web site: www.jrproductsinc.com. Distributor of Handi-Foam.

Fomo Products, P.O. Box 1078, Norton, OH 44203. Tel: (800) 321-5585 or (330) 753-4585; Fax: (330) 753-5199; E-mail: info@fomo.com; Web site: www.fomo.com.

INFORMATION RESOURCES

Another Passive Solar Design Book

A book review in the May 2003 issue of *EDU* rashly declared that "the need for a good book on passive solar house design remains unmet." Rising to the challenge, Steven Winter sent *EDU* a copy of *The Passive Solar Design and Construction Handbook* for review (see Figure 8). Winter is the principal of Steven Winter Associates in Norwalk, Connecticut; his company is collectively credited with authoring the book.

The Passive Solar Design and Construction Handbook was originally published by Rodale Press in 1983; the current revised edition was published in 1997. (The book's mysterious inclusion of ten pages of graphics depicting every available type of concrete block stems from the fact that Steven Winters Associates' contract to write the book was partly sponsored by the National Concrete Masonry Association.)

High Ratios for South-Facing Glazing

Compared to the Daniel Chiras book reviewed in May, the Steven Winter book provides more of the theory and technical calculations underlying passive solar design, and might therefore prove more valuable to engineers. But not all of the book's technical recommendations are trustworthy. In the chapter on direct gain, the book includes a chart with recommended areas for south-facing glazing in a passive solar house. The chart advises that a house located in northern Vermont (44° north latitude, 20°F average December and January temperatures) should have a ratio of south-facing glazing to floor area of 29%. This figure is puzzling, since most passive solar designers recom-

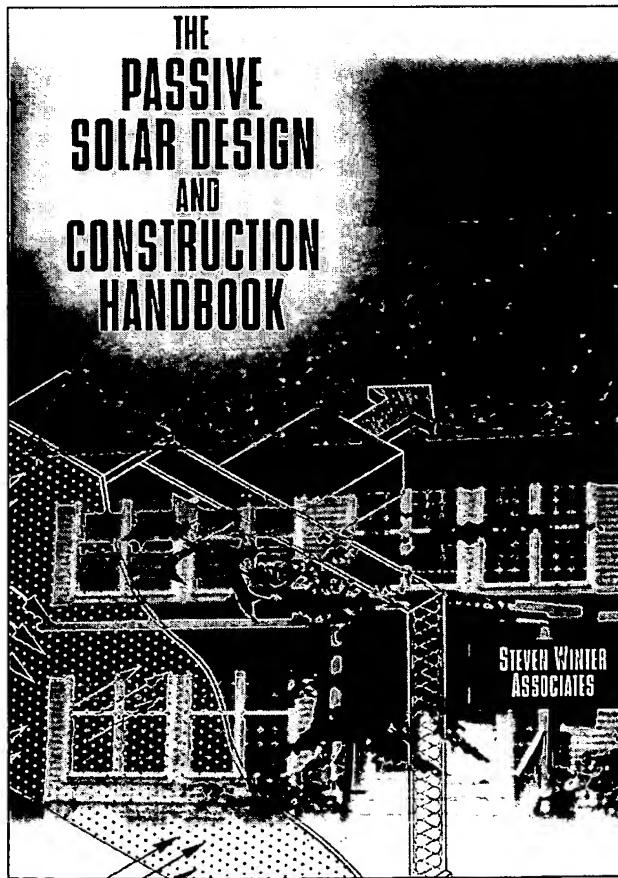


Figure 8. *The Passive Solar Design and Construction Handbook*, originally published in 1983, was revised and reissued by Steven Winter Associates in 1997.

mend a maximum ratio of 6% to 8% in a house with little thermal mass, or up to 14% to 16% in a house with substantial thermal mass. A designer using the Steven Winter ratio of 29% would end up with a house at grave risk of overheating.

Decorating With Water-Filled Drums

The Passive Solar Design and Construction Handbook shows many signs of its early-80s origins. All of the book's 24 designs for passive solar houses are over two decades old. Of these 24 houses, 14 have sloped glazing, five include manually operated insulating shutters, four include rock beds for thermal storage, and seven include the use of exposed water-filled drums. Water-filled drums? It's enough to make a reader nostalgic for the Jimmy Carter years. "Nobody's installing water-filled drums anymore," said Andy Shapiro, a Montpelier, Vermont, energy consultant, in a recent interview. "For one thing, it takes a lot of space — about 4 square feet for each drum or stack of drums. That's expensive space to build. And people don't want to look at the things."

The old aphorism that "a passive solar house requires an active owner" was recently verified by Harrison Fraker, the dean at the College of Environmental Design at the University of California in Berkeley. Commenting on his design for one of the solar greenhouses included in the Steven Winter book, Fraker

noted, "The design depended on having an owner who understood how it worked, and who was willing to open and close the windows and curtains and vents at the right time."

As the consultants at Steven Winter Associates know well, building science has made great strides since 1983. Among the factors that have changed designers' approaches to passive solar design are improved techniques for superinsulation; the invention of the blower door, which provided clues to the importance of air sealing; better knowledge of the penalties of duct leakage; the development of improved types of glazing; and the increasing scarcity of homeowners willing to engage in the manual adjustment of shutters and vents. These factors, none of which are mentioned in *The Passive Solar Design and Construction Handbook*, have changed our understanding of the cost-effectiveness of such features as water-filled drums, rock bins, and manual night shutters. Most designers now realize that the money formerly invested in these features is better invested in improved insulation and air sealing.

The Passive Solar Design and Construction Handbook by Steven Winter Associates (ISBN #0-471-18308-3) is available for \$110 from John Wiley and Sons, 10475 Crosspoint Blvd., Indianapolis, IN 46256. Tel: (877) 762-2974; Fax: (800) 597-3299; E-mail: customer@wiley.com; Web site: www.pfeiffer.com/WileyCDA.

READERS' FORUM

"Wet-Spray" Is a No-No

Dear Editor:

Recently I have noticed that *EDU* uses the term "wet-spray" to refer to spray-applied cellulose. It is true that many years ago, cellulose insulation was installed wet because of commonly held perceptions on technique and because of rather unadapted product and equipment. But today, "wet" is an inaccurate description. The installed product is better described as moist. We respectfully request that future *EDU* articles referencing spray-applied cellulose insulation not be referred to with the words "wet-spray."

[Edited for length]

Matthew J. Adams
Applegate Insulation
Webberville, Michigan

Dear Editor:

Matthew Adams sent me a copy of his letter to you regarding the use of the term "wet spray cellulose," and I have to say that I agree with his comments. I would like to join Matthew in requesting that the words "wet spray cellulose" be henceforth banned from the pages of *EDU*.

[Edited for length]

Daniel Lea, executive director
Cellulose Insulation Manufacturers Association
Dayton, Ohio

Editor's Reply

The letters from Matthew Adams and Daniel Leas are puzzling, since a word search of back issues shows that *EDU* has not used the term "wet-spray" in reference to cellulose since February 1998, when *EDU* directly quoted a builder who used the term. In recent years, *EDU* has occasionally referred to spray-applied cellulose as a "damp-spray" product, a description which seems fairly close in meaning to Adams's preferred term, "moist."

BACK PAGE

“Insulating” Paint Lives On

Over the years, many “miracle” energy-saving products have been promoted to homeowners. Among the most persistent such products are “insulating” paint and its cousin, ceramic beads (see “Still No Help for Ceramic Beads,” *EDU*, November 2000, and “Fantasy Rerun of the Month,” *EDU*, January 1997). A Vero Beach, Florida, company called Insuladd is among the latest generation of companies touting the virtues of ceramic beads to homeowners.

As *EDU* has reported for years, ordinary white paints (and other paints with high solar reflectance), by lowering the temperature of surfaces to which they are applied, can reduce air conditioning bills in some buildings, especially poorly insulated buildings. But no paint yet invented can significantly increase a wall’s R-value.

Nevertheless, Insuladd’s promoters, undeterred by facts, describe their product as “the paint additive that insulates.” The company has coined an undefined phrase, “insulation equivalencies,” which it uses to

promote a fictitious R-value for its paint. According to Insuladd, “The performance of Insuladd when mixed with a light-colored house paint can be expected to parallel the R-20 (radian) and R-5 (passive) insulation equivalencies documented by commercially available insulating coatings” — whatever that means. These “insulation equivalency” calculations embolden the company to declare that their paints “achieve a very high insulation value.” Not convinced yet? Maybe this will entice you: “Insuladd insulating additives and Insuladd insulating house paints can reduce utility bills by 40%!”

Hidden among these deceptive claims is one that rings true: Insuladd paint “looks and applies just like ordinary house paint.” For more information, check out the Web pages of Insuladd (www.insuladd.com) and Energy Savers of America (www2.cajun.net/~mrfoil/esainsuladd1.html).

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Exhibit H

Blower Door Test/Building Tightness/Chimney Safety TestHouse InformationJob# 3237Date: 7/3/02Job Name RodgersTown Prospect ParkBlower Door Test: Yes No: Give Reason:# of conditioned stories: 2Volume: 15,200Basement Included: Yes No Surface Area: 2325Type Model: Minps. #2 #3Exposed Normal Shielded

Method Used for CFM50:

Type of structure: Frm Single

Computer/Graph/ direct read

PRE TEST(CFM50): 4931Tester: TH.

Describe conditions and large air leakages:

Trap door AreaNumber of occupants: 4
Number of smokers: 1Other MVG adjustments _____
Total MVG adjustment 1750POST TEST at CFM50: 3501 Tester: ecwDescribe minor air sealing performed: base boards, windows & doors, entrance doors
Trap door energy barrierThis section is to be performed after all weatherization work is completedChimney safety test: Outside Temp. 90 Exhaust devices activated 2Furnace fan activated: yes no n/a Spillage: Heater EFW other: _____Draft(iwc/pascals): Primary Heater 05 DHW _____ Other _____Are there any negative pressure exist in the area of the combustion appliance zone while a forced air distribution system fan is operating, Yes No COMMENTS: Boiler

Exhibit I

[Home](#)[Up](#)[Energy Shield II Photos](#)

Progressive Energy Solutions, Inc.®
Light Years Ahead.



[Energy Shield I Pictures & Info](#)

[Energy Shield II Pictures & Info](#)

[Energy Shield I & II Installations](#)

Energy Shield I™ *(Patent Pending)*

This attic access pull-down ladder has R-13 insulation installed between the steps and is mashed in places which degrades the R-value to considerably less than R-13. The outside edges do not have any insulation around the edges. There is no way to seal this unit or prevent radiant heat from penetrating the access door.



This is the *Energy Shield I™* unit which is capable of sealing the entire opening with a R-32 Value and a radiant barrier that is 98% reflective. The lid comes in two pieces for easy handling and storage. The attic entrance end piece is removable to facilitate movement into and out of the attic.

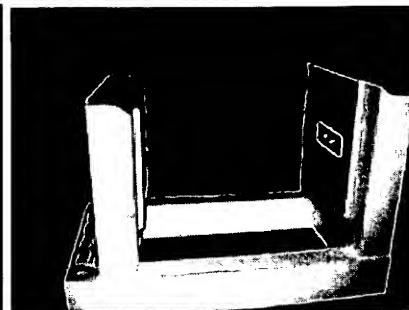
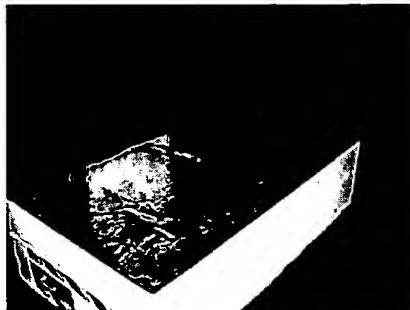


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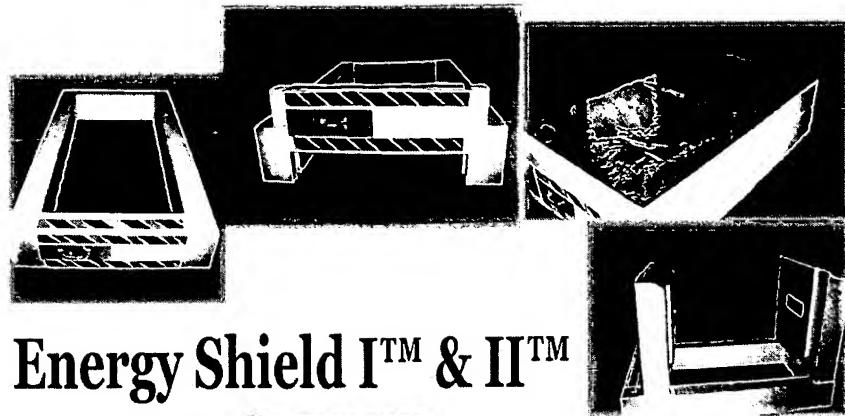
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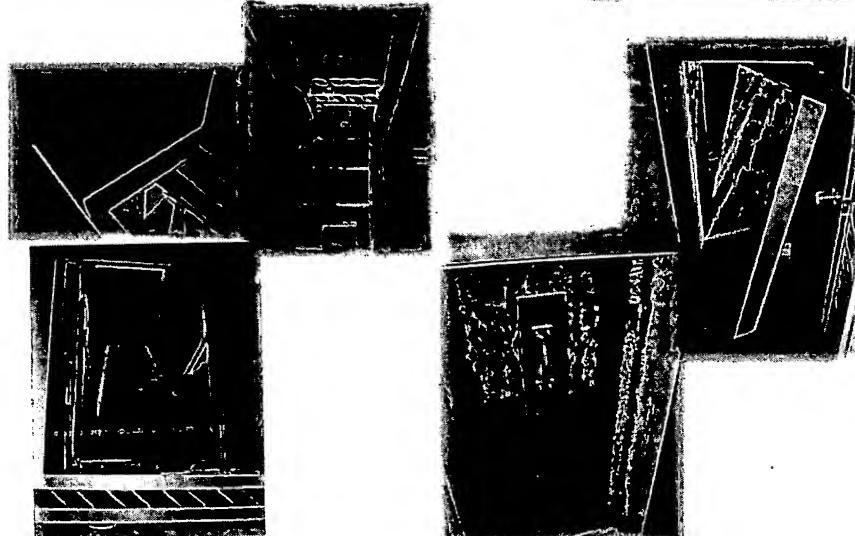
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Energy Shield I™ & II™



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